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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/688,452

10/18/2003

Stephan Grunow

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04/01/2008

TEXAS INSTRUMENTS INCORPORATED

P O BOX 655474, M/S 3999

DALLAS, TX 75265

EXAMINER

CHANG, RICK KILTAE

ART UNIT

PAPER NUMBER

3726

NOTIFICATION DATE

DELIVERY MODE

04/01/2008

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/688,452	Applicant(s) GRUNOW ET AL.	
	Examiner Rick K. Chang	Art Unit 3726	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 January 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4, 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xi et al (US 7,026,238) in view of Mathis (US 5,370,737).

Xi discloses in forming a via through a dielectric layer (Fig. 2); col. 1 discloses using copper for electrical lines and 206 is inherently a copper line; depositing 208; Fig. 3 etching step; 220 is second barrier layer; 202 is a trench; Figs. 5-6 show barrier layers in 202; filling with copper (col. 4, lines 25-27). See col. 3, lines 6-67, and col. 4, lines 1-67 and entire col. 5. Fig. 5 shows 220 is deposited on the bottom surface of the via 212. Xi fails to disclose the etching selectively is performed in a physical vapor deposition tool.

Mathis discloses etching selectively is performed in a physical vapor deposition tool (col. 8, lines 37-42).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Xi by etching selectively is performed in a physical vapor deposition tool, as taught by Mathis, for the purpose of preventing introducing unwanted oxidation during transfer of the wafer from one chamber to another chamber and reducing cost by performing multiple processes in one machine rather than separate machines.

3. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Xi et al (US 7,026,238) in view of Aoi (US 6,197,696).

Xi discloses in forming a via through a dielectric layer (Fig. 2); col. 1 discloses using copper for electrical lines and 206 is inherently a copper line; depositing 208; Fig. 3 etching step; 220 is second barrier layer; 202 is a trench; Figs. 5-6 show barrier layers in 202; filling with copper (col. 4, lines 25-27). See col. 3, lines 6-67, and col. 4, lines 1-67 and entire col. 5. Fig. 5 shows 220 is deposited on the bottom surface of the via 212.

Xi discloses TiNSi for a barrier layer but fails to disclose providing plasma+silane treated CVD.

Aoi discloses providing plasma+silane treated CVD (col. 10, lines 54-59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Xi by providing plasma+silane treated CVD, as taught by Aoi, for the purpose of providing an organic/inorganic hybrid film.

4. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Xi et al (US 7,026,238)/Mathis (US 5,370,737) as applied to claim 1 above.

Xi discloses sputtering PVD for a second barrier layer but fails to disclose ionized PVD for a first barrier layer. At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to use flash PVD because Applicant has not disclosed that depositing using a flash PVD provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with using sputtering PVD because this would save production cost by purchasing a new equipment that uses a different

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method. Therefore, it would have been an obvious matter of design choice to modify Xi to obtain the invention as specified in claim 7.

5. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xi et al (US 7,026,238)/Mathis (US 5,370,737) as applied to claim 1 above, and further in view of Rozbicki et al (US 6,607,977).

Xi/Mathis disclose TaN for first barrier layer but fails to disclose an ionized PVD for both etching and depositing in the PVD barrier chamber.

Rozbicki discloses in col. 3, lines 41-50 an ionized PVD for both etching and depositing in the PVD barrier chamber.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Xi/Mathis by an ionized PVD for both etching and depositing in the PVD barrier chamber, as taught by Rozbicki, for the purpose of performing without breaking vacuum.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Xi et al (US 7,026,238)/Mathis (US 5,370,737) as applied to claim 1 above.

Xi/Mathis fail to disclose that the second barrier layer has lower resistivity with respect to the first barrier layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use one of the materials with lower resistivity for the second barrier layer than the first barrier layer, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse*, 86 USPQ 70.

Response to Arguments

7. Applicant's arguments filed 1/18/08 have been fully considered but they are not persuasive.

The examiner maintains his rejection.

Mathis discloses in col. 8, lines 41-42 that hybrid forms of PVD processes and CVD processes as well as etching processes (PVD etching processes and CVD etching processes) are performed within the annular treatment chamber. Further, since the annular treatment chamber performs different vacuum treatment processes (hybrid forms of PVD processes and CVD processes as well as etching processes), this chamber is a PVD, CVD etching tool. Therefore, the deposition and etching processes (in the order, vice versa and/or simultaneously) can be performed within the chamber without ever leaving the chamber. This would greatly save production cost since there is no need for purchasing separate equipment (chamber) for deposition and etching processes.

Re claim 5: Xi discloses in forming a via through a dielectric layer (Fig. 2); col. 1 discloses using copper for electrical lines and 206 is inherently a copper line; depositing 208; Fig. 3 etching step; 220 is second barrier layer; 202 is a trench; Figs. 5-6 show barrier layers in 202; filling with copper (col. 4, lines 25-27). See col. 3, lines 6-67, and col. 4, lines 1-67 and entire col. 5. Fig. 5 shows 220 is deposited on the bottom surface of the via 212. Xi discloses TiNSi for a barrier layer but fails to disclose providing plasma+silane treated CVD. Aoi discloses providing plasma+silane treated CVD (col. 10, lines 54-59). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Xi by providing plasma+silane treated CVD, as taught by Aoi, for the purpose of providing an organic/inorganic hybrid film. This kind of hybrid film will greatly enhance adhesion between organic/inorganic materials.

Re claims 9-11: In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., "This differs from the claimed invention in that claim 1 requires etching and after etching, depositing" and "the claimed etch followed by dep results in removal of the first barrier at the bottom of the via and deposition of the second barrier over the bottom of the via") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Rozbicki discloses in col. 3, lines 41-50 an ionized PVD for both etching and depositing in the PVD barrier chamber. Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform etching and depositing steps in different order.

The art of CVD, PVD, ionized PVD and etching processes are old and well known in the art.

Interviews After Final

8. Applicant note that an interview after a final rejection must be submitted briefly in writing the intended purpose and content of the interview (the agenda of the interview must be in writing). Upon review of the agenda, the Examiner may grant the interview if the examiner is convinced that disposal or clarification for appeal may be accomplished with only nominal further consideration. Interviews merely to restate arguments of record or to discuss new limitations will be denied. See MPEP 714.13 and 713.09.

Conclusion

9. Please provide reference numerals (either in parentheses next to the claimed limitation or in a table format with one column listing the claimed limitation and another column listing corresponding reference numerals in the remark section of the response to the Office Action) to all the claimed limitations as well as support in the disclosure for better clarity (optional).

Applicants are duly reminded that a full and proper response to this Office Action that includes any amendment to the claims and specification of the application as originally filed requires that the applicant point out the support for any amendment made to the disclosure, including the claims. See 37 CFR 1.111 and MPEP 2163.06.

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick K. Chang whose telephone number is (571) 272-4564. The examiner can normally be reached on 5:30 AM to 1:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David P. Bryant can be reached on (571) 272-4526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rick K. Chang/
Primary Examiner, A.U. 3726

RC
March 28, 2008